Our Reference: WOJ-100-A PATENT

# BEVERAGE AND FOOD TEMPERATURE NOTIFICATION DEVICE

## RELATED APPLICATIONS

[0001] This application is a continuation of U.S. Provisional Application Serial No. 60/455,750 filed March 19, 2003, and U.S. Provisional Application Serial No. 60/529,673 filed December 15, 2003.

## FIELD OF THE INVENTION

[0002] The present invention relates to a device for monitoring the temperature of a beverage or food, and more particularly, to a device for automatically indicating, through a combination of audible and visible signals, various stages of a process of heating a baby food or beverage.

## BACKGROUND OF THE INVENTION

[0003] When feeding babies, it is usually desirable for the temperature of the beverage, such as milk or formula, or food, such as strained vegetables or meats, to be at normal body temperature (98.6° Fahrenheit), but if not at this exact temperature, then within a suitable temperature range, for example 70° Fahrenheit to 99° Fahrenheit. If the served beverage or food temperature is below or above said range, there is a possibility the baby will reject the beverage or food as unpalatable, or even the unsafe possibility of scalding the baby's mouth.

[0004] In order to keep baby beverages or foods from spoiling prior to serving, the container and contents thereof are usually kept refrigerated, typically within a temperature range from 34° Fahrenheit to 45° Fahrenheit, which is a range below the aforementioned, suitable temperature range for feeding. Some baby beverages or foods can be stored at room temperature without spoiling, typically within a range from 63° Fahrenheit to 81° Fahrenheit, which is still a range below the aforementioned body temperature (98.6° Fahrenheit) that many babies will prefer. Thus, in many cases, a care giver must heat the baby beverage or food prior to serving in order to meet a baby's feeding preferences.

[0005] Since it is not atypical for a baby to cry suddenly and loudly wanting to be fed, a care giver usually wants to heat the baby beverage or food to said suitable temperature range as quickly as possible, not only to satiate the baby but also to end

the troublesome crying. Therefore, to ensure a reasonably quick heat-up time, the preferred heating devices and methods will apply heat to the baby beverage or food container in a rapid fashion. Commercially available baby bottle and food jar warmers can heat the beverage or food contents therein from the aforementioned storage temperature range to the suitable serving temperature range generally within four to thirty minutes, depending on the beverage or food storage temperature, the amount of beverage or food to be heated, and other factors specific to the beverage or food container, the warming device and its attendant method. However, regardless of these factors, a heat-up time exceeding ten minutes is generally unacceptable for most care givers, whereas a heat-up time of five minutes or less is generally preferable.

[0006] Conventional heating devices use a jacket of liquid water or steam to heat a container and its baby beverage or food contents. In the first case, the container and contents thereof are partially submerged upright in a vessel of warm or hot water. In the second case, the container and contents thereof are placed upright in a steam chamber. In most commercial devices, household electricity is used to power the heat source, which is typically a resistive heating element. Other non-commercial heating methods are known, such as partially submerging the beverage or food container upright in a vessel of hot tap water or upright in a pan of boiling water on a stove, or simply running hot tap water over the container. Other heat transfer mechanisms are known, such as electric blankets, thermo-chemical reaction blankets or the like. Regardless of the device or method used, in order to achieve sufficiently high heat transfer rates to the beverage or food container and thus the preferably low heat-up times, the heating device's water jacket, steam chamber, or other heat transfer mechanism's temperature is kept at a temperature well above the aforementioned suitable baby beverage or food temperature range. Higher water jacket, steam chamber or other heat transfer mechanism temperatures will yield lower beverage or food heat-up times. Conversely, lower water jacket, steam chamber or other heat transfer mechanism temperatures will yield higher beverage or food heat-up times.

[0007] Considering the aforementioned heating devices and attendant methods, those providing the lowest heat-up times will also overheat the bottle to unpalatable or unsafe, scalding temperatures if the beverage or food container is left in the

warming device too long. For example, in the case of commercial water jacket heaters, the fastest devices maintain the jacket temperature around 135° Fahrenheit via thermostatic control. If the beverage or food container is left in the water jacket long enough, the temperature of the beverage or food will reach 135° Fahrenheit, which is an unsafe, scalding temperature. In the case of commercial steam chamber heaters, whereby steam is generated in a space maintained at atmospheric pressure, the temperature of the beverage or food could reach 212° Fahrenheit, provided a sufficient amount of steam is generated in the chamber and the beverage or food container remains in the chamber long enough. Steam chamber heaters can suffer another disadvantage, which is the beverage or food never reaches the aforementioned, suitable serving temperature range because the care giver places an insufficient amount of water in the heating chamber at the onset of heating, and thus an insufficient amount of steam is generated.

[0008] Thus, to achieve a desired beverage or food temperature during the aforementioned heating processes, and even more importantly, to avoid overheating the baby beverage or food, the care giver must check the temperature of the beverage or food frequently and make sure to remove the beverage or food container from the heating device when the beverage or food reaches the aforementioned, suitable temperature range. This necessity of frequent temperature checking is a hassle in and of itself, but also leads to several other inconveniences. One inconvenience is the care giver's freedom to substantially leave the vicinity in which the heating takes place is reduced, since checking of the beverage or food temperature must occur frequently. Another inconvenience is the care giver must be constantly mindful of the heating process, so as not to forget to check the beverage or food temperature frequently. The latter inconvenience can be particularly troubling during nighttime feedings, when the care giver would most like to return to sleep or rest after initiating the heating process, even if for only a matter of minutes, rather than stay alert to frequently check the beverage or food temperature. Still another inconvenience are the age-old methods care givers use for checking the beverage or food temperature, which in the case of beverages, such as milk, is to sense the temperature by expressing a small amount of milk on a wrist, which is messy and arguably inaccurate, and in the case of

foods, such as strained peas, is to test the temperature by tasting a spoonful, which can be unappetizing for some care givers and potentially unhealthy if the soiled spoon is shared between care giver and baby.

[0009] Thus, with respect to the above-mentioned heating means and methods, there is an unmet need for providing a baby beverage and food temperature notification apparatus for monitoring the temperature of the contents of a baby beverage or food container throughout the heating process, and for automatically and remotely signaling, preferably via a combination of audible and visible signals, when the baby beverage or food has attained a temperature within a predetermined range suitable for feeding, all this in order to eliminate the common practice and current need to frequently check the baby beverage or food temperature by manual and tactile means.

## SUMMARY OF THE INVENTION

[0010] In accordance with the present invention, a preferred embodiment of a beverage and food temperature and notification device automatically signals, via a combination of audible and visible indicators, whether or not the contents of a baby beverage or food container have attained, during the process of being heated, a temperature within a predetermined range suitable for serving the beverage or food to a baby. The beverage and food temperature notification device includes a probe having a temperature responsive end, which may be placed in intimate contact with a baby beverage or food stored in a container for the purpose of continuously monitoring the temperature of said beverage or food throughout heating of said beverage or food. The probe is slideably disposed in a support member, whereby said support member rests upon an upper, open end of said beverage or food container, thereby allowing the longitudinal axis of said probe to be maintained substantially coincident with the longitudinal axis of said beverage or food container, and further allowing the temperature responsive end of said probe to be adjusted to various locations in said container and in the beverage or food contents thereof.

[0011] Additionally, said probe includes a temperature sensor for providing an electrical signal that is proportional to a sensed temperature. In addition, a case is provided along said probe for housing operational electrical circuitry. The operational

electrical circuitry receives said electrical temperature signal from said temperature sensor.

[0012] The case also provides a control area, which is interactive with said operational circuitry, and includes a first switch for activating and deactivating the beverage and food temperature notification device as well as for selecting a volume level for a sound speaker that is housed in the case. Furthermore, the control area includes a second switch for selecting the unit of temperature measurement to be utilized and displayed (°C or °F) in a notification area. The notification area, which is provided on the case, is interactive with said operational circuitry, for indicating various conditions, such as (1) whether or not the beverage and food temperature notification device is activated; (2) whether or not the temperature of a beverage or food being sensed is within a predetermined range suitable for serving to a baby; (3) when the temperature of a beverage or food being sensed has reached a specific target value or target range; (4) the actual temperature of a beverage or food when said temperature is within a predetermined range suitable for serving a baby; and (5) the level of battery life remaining. Specifically, said notification area has a visible indicator, preferably of the liquid crystal display (LCD), which is used in combination with an audible indicator, preferably a speaker or speakers of the piezo type, to notify a user, such as a baby's care giver, of the aforementioned conditions.

[0013] To initiate operation, the baby's care giver activates the beverage and food temperature notification device via said first switch, causing said operational circuitry to energize the LCD to indicate said activation. The care giver also uses said first switch to select an appropriate speaker volume from one of at least two sound pressure levels, such as "low" or "high", whereby a low speaker volume is suitably audible over short distances, such as across a bedroom, and a high speaker volume is suitably audible over a larger distance, such as across an entire home. In addition, the care giver uses said second switch to select the unit of temperature measurement to be utilized and displayed on the LCD (°C or °F). For the purpose of describing the invention henceforth, it will be assumed the selected unit of temperature is "°F".

[0014] To further commence operation, the probe is inserted through an open end of a beverage or food container, which may be a nursing bottle, food jar or the

like, such that the probe is maintained in intimate contact with the baby beverage or food thereof, whereby said intimate contact is intended to occur throughout a heating process of the food container and contents thereof, such as by a commercial baby bottle warmer. Whilst said intimate contact and heating process occur simultaneously, the operational circuitry simultaneously compares the temperature signal received from the temperature sensor to a predetermined temperature range, where said predetermined temperature range is defined preferably as 70° Fahrenheit to 99° Fahrenheit. Whenever the temperature of the beverage or food being heated is less than 70° Fahrenheit, said operational circuitry causes the LCD to display the word "COLD" to indicate the temperature of the beverage or food is unsuitably low for serving to a baby. Meanwhile, the speaker is silent. Whenever the temperature of the beverage or food being heated becomes equal to 70° Fahrenheit, said operational circuitry causes the LCD to instead display "70 COOL" and simultaneously causes the speaker to emit a first audible tone for a discrete length of time at the selected volume level, all this to indicate the temperature of the beverage or food has reached a first point marginally suitable for serving to a baby. Whenever the temperature of the beverage or food being heated becomes equal to or is between 71° Fahrenheit and 89° Fahrenheit, said operational circuitry causes the LCD to instead display the actual value of the temperature measured followed by the word "COOL" (for instance, "86 COOL"), to indicate the temperature of the beverage or food is within a range marginally suitable for serving to a baby. Meanwhile, the speaker is silent. Whenever the temperature of the beverage or food being heated becomes equal to 90° Fahrenheit, said operational circuitry causes the LCD to instead display "90 READY" and simultaneously causes the speaker to emit a second audible tone for a discrete length of time at the selected volume level, whereby the nature of the second tone is clearly distinguishable from the first, all this to indicate the temperature of the beverage or food has reached a first point ideal for serving to a baby, as opposed to the first point marginally suitable for serving to a baby (70° Fahrenheit). Whenever the temperature of the beverage or food being heated becomes equal to or is between 91° Fahrenheit and 99° Fahrenheit, said operational circuitry causes the LCD to instead display the actual value of the temperature measured followed by the word

"READY" (for instance, "96 READY"), to indicate the temperature of the beverage or food is within a range ideally suited for serving to a baby. Meanwhile, the speaker is silent. Whenever the temperature of the beverage or food being heated is greater than 99° Fahrenheit, said operational circuitry causes the LCD to instead display the word "HOT" and simultaneously causes the speaker to emit a third audible tone that emits continuously (at the selected volume level) until the device is turned off or until the actual value of the temperature measured decreases to a value equal to or less than 99° Fahrenheit, all this to indicate the temperature of the beverage or food is too high for serving to a baby. At any time during operation, the care giver can deactivate all visible and audible indicators by moving the first said switch of the beverage and food temperature notification device back to the "off" position.

[0015] Further areas of applicability of the present invention will become readily apparent from the following detailed description, which is to be read in connection with the accompanying drawings. It should be understood that the detailed description and specific examples, while indicating a preferred embodiment of the invention, are intended for purposes of illustration only and are not intended to limit the scope of the invention.

## BRIEF DESCRIPTION OF THE DRAWINGS

[0016] The description herein makes reference to the accompanying drawings wherein like reference numerals refer to like parts throughout the several views, and wherein:

[0017] FIG. 1 is an elevation view of the beverage and food temperature notification device according to one embodiment of the present invention;

[0018] FIG. 2 is a perspective view of the beverage and food temperature notification device according to one embodiment of the present invention;

[0019] FIG. 3 is a front elevation view and a side elevation view of the beverage and food temperature notification device according to one embodiment of the present invention;

[0020] FIG. 4 is a partial perspective view of the beverage and food temperature notification device according to one embodiment of the present invention showing a probe support member removed from a probe assembly;

[0021] FIG. 5 is an elevation view of the beverage and food temperature notification device shown in Fig. 1, but with different indicia shown on the LCD display;

[0022] FIG. 6 is an elevation view of a conventional nursing bottle shown filled with a beverage and fully assembled;

[0023] FIG. 7 is an elevation view of the beverage and food temperature notification device of Fig. 1, shown situated against the conventional nursing bottle of Fig. 6 having the nipple and collar assembly of the bottle removed;

[0024] FIG. 8 is a flow chart describing the use of and the logic performed by the operational circuitry of one embodiment of the present invention;

[0025] FIG. 9 is a view similar to Fig. 1 but showing the support member in a different location relative to the probe and case;

[0026] FIG. 10 is similar to Fig. 9, but with different indicia shown on the LCD display;

[0027] FIG. 11 is a view similar to Fig. 7, showing another embodiment of the present invention where a non-contact temperature sensor is employed in place of a contact-type temperature sensing probe;

[0028] FIG. 12 is similar to Fig. 9, but with different indicia shown on the LCD display;

[0029] FIG. 13 is similar to Fig. 9, but with different indicia shown on the LCD display;

[0030] FIG 14 is similar to Fig. 9, but with different indicia shown on the LCD display;

[0031] FIG. 15 is an elevational view of the beverage and food temperature notification device according to a second preferred embodiment of the present invention;

[0032] FIG. 16 is a side elevation view of the beverage and food temperature notification device according to the second preferred embodiment of the present invention;

[0033] FIG. 17 is a top plan view of the beverage and food temperature notification device according to the second preferred embodiment of the present invention;

[0034] FIG. 18 is an elevation view of the beverage and food temperature notification device according to the second preferred embodiment of the present invention showing a probe support member removed from a probe assembly;

[0035] FIG. 19 is a cross-section view taken along line X-X of Fig. 16, showing a diagrammatic illustration of the operational circuitry of the present invention;

[0036] FIG. 20 is an elevation view of the second preferred embodiment beverage and food temperature notification device in use, situated against the conventional nursing bottle of Fig. 6 having the nipple and collar assembly of the bottle removed;

[0037] FIG. 21 is a flow chart describing the logic performed by the operational circuitry of a the second preferred embodiment of the present invention;

[0038] FIG. 22 is a side elevational view showing an alternately configured case of the beverage and food temperature notification device, wherein the case is of a different shape and the control and message areas may be provided on a top face rather than a side face;

[0039] FIG. 23 is a top plan view of the embodiment of Fig. 22; and

[0040] FIG. 24 is elevational view similar to Fig. 20, showing a non-contact temperature sensor used in place of a contact-type temperature-sensing probe.

## PREFERRED EMBODIMENT

[0041] Referring to **FIG's 1** and **2** of the drawings, a beverage and food temperature notification device **100**, has a case **102** joined to a temperature responsive probe **104**, and a support member **106** engaged with said probe. Case **102** houses operational circuitry and a battery or batteries, and includes control and notification areas, which are discussed in greater detail hereinafter. Probe **104** may be constructed at least partially of a suitably heat conductive material, such as stainless steel, may be rigid or flexible in nature, and is preferably rigidly affixed to case **102**. Disk-like support member **106** has a centrally located opening **108** that engages probe **104**,

whereby the support member will normally remain in place relative to the probe. Although said support member is preferably circular, other shapes are possible, such as square, rectangular, triangular and so forth. The static position of support member **106** relative to case **102** and probe **104** may be adjusted by exerting a predetermined amount of force against the support member about the longitudinal axis of probe **104.** One possible position of the support member is shown in **FIGS. 1 and 2**. In addition, as shown in **FIG. 4**, support member **106** can be removed from probe **104** by sliding action, where said removal will be generally desirable for minimizing the space required for storage of the notification device **100** when not in operation, and for the purposes of compact retail packaging for notification device **100**, and for enabling thorough cleaning of probe **104** between uses.

[0042] Continuing to refer to **FIG. 1**, probe **104** houses a temperature sensor (not shown), preferably a thermistor, although other devices, for example, thermocouples or resistance temperature detectors, may be used, where said temperature sensor is typically located at or near tip **502** of said probe for providing an electrical signal that is proportional to a sensed temperature. Probe tip **502** is preferably made from a good conductor of heat, such as stainless steel. Operational circuitry (not shown) is housed in case **102** and receives said electrical temperature signal from said temperature sensor in a generally known manner. Said operational circuitry may comprise analog or digital devices and may be microprocessor based. A replaceable battery or batteries (not shown) powers the operational circuitry. The notification device **100**, including case **102**, probe **104** and support member **106**, may be water resistant or water proof for ensuring reliable operation of said operational circuitry.

[0043] Referring to **FIG. 6,** there is shown a known nursing bottle **600**, having a nipple **602** attached to a bottle **604** by a threaded collar **606**. Bottle **604** is shown filled with a beverage or food **608**.

[0044] Referring to **FIG. 7**, notification device **100,** is illustrated in use with nursing bottle **600**, wherein the nursing bottle and contents thereof are subjected simultaneously to a conventional heating method (not shown), such as upright, partial immersion in water. Specifically, a nipple and collar assembly, designated generally by

reference numeral **700**, is shown removed from the bottle **604** to provide an opened end of said nursing bottle. Support member **106** rests upon the opened end of the nursing bottle, firstly enabling the notification device **100** to be viewed reliably by a user, such as a baby's care giver, and secondly enabling the notification device **100** to be maintained in operable communication with the nursing bottle and contents thereof. Furthermore, the user can slide case **102** and probe **104** relative to support member **106** in order to position tip **502** of probe **104** at a desired and suitable location within the nursing bottle, specifically into intimate contact with the nursing bottle contents **608**, which may be any beverage or food, such as milk, juice, water or cereal, for the purpose of sensing the temperature of said contents. The ability to adjust the position of tip **502** is particularly advantageous given the various shapes and sizes of commercially available baby beverage and food containers, and given the varying amounts of beverage or food that may reside in the container. While support member **106** preferably rests by gravity upon the opened end of the beverage or food container, it should be appreciated that other features for adapting the support member in a more secure or even sealed way to the container can be provided, such as by thread or other clamping feature. In addition, it should be appreciated that the fixed diameter of the support member **106** can be sized so as to fit upon a variety of baby bottles, jars, and the like.

[0045] Referring now to **FIG. 3**, case **102** provides a control area **110,** shown in broken line representation, whereby the control area may include a first switch **112** by which the user can activate and deactivate the notification device **100** as well as select a volume level for a sound speaker and a second switch **142** for selecting the unit of temperature measurement to be utilized and displayed (°C or °F) in a notification area **114**, which will be discussed later in greater detail. Said control and notification areas are interactive with said operational circuitry, for indicating various conditions, such as (1) whether or not the beverage and food temperature notification device is activated; (2) whether or not the temperature of a beverage or food being sensed is within a predetermined range suitable for serving to a baby; (3) when the temperature of a beverage or food being sensed has reached a specific target value or target range; (4) the actual temperature of a beverage or food when said temperature

is within a predetermined range suitable for serving a baby; and (5) the level of battery life remaining. Specifically, said notification area **114**, provided by case **102** and shown in broken line representation, comprises a visible indicator **128**, preferably of the liquid crystal display (LCD) type, and an audible indicator **129**, preferably a speaker or speakers of the piezo type, which may be used in combination to notify a user, such as a baby's care giver, of the aforementioned conditions. Specifically, the LCD displays various indicia to clearly indicate or signal each of the aforementioned conditions. Similarly, the audible indicator **129** signals some of the aforementioned conditions by emitting sound waves that exit through an opening **126** in the face of case **102**. In addition to providing a control area **110** and a notification area **114**, case **102** provides a surface **130** on which a trademark for the device can be printed. In addition, case **102** provides a surface on which various icons can be printed for clarifying the functional positions of switch **112**, such as icons to indicate the "off" position **132**, the "low-volume audible signal" position **134,** and the "high-volume audible signal" position **136**. Similarly, the functional positions of switch **142** are clarified by printed icons that indicate the "°F" position **138** and the "°C" position **140**.

[0046] The operation and use of notification device **100**, specifically in conjunction with the heating of a baby beverage or food container, such as a nursing bottle, will be better appreciated with specific reference to **FIG's 1** and **3** and the logic flow chart shown in **FIG. 8**. A user's control of notification device **100** starts at step **800**. When notification device **100** is in an inoperative state, all visible and audible indicators are de-energized, as shown in step **802**. According to step **804**, the user can activate the notification device **100** by moving the position of switch **112** from the "off" position **132** into the "low-volume speaker" position **134** or into the "high-volume speaker" position **136**, with the latter case illustrated in **FIG. 1** and **FIG. 3**. In a quiet setting, such as a middle-of-the-night baby feeding session in the user's bedroom, the user might select the "low-volume speaker" position **134** so the audible signal, when it occurs, will not awaken members of the household sleeping in other rooms, nor awaken the care giver in a startling manner, should the care giver have intentionally gone back to sleep after completing step **812**. Step **812** will be

discussed later in further detail. In a louder setting, such as a middle-of-the-day baby feeding session in a home or in a restaurant, the user might select the "high-volume speaker" position **136** to ensure the audible signal, when it occurs, can be heard easily over background noises and over large distances, such as throughout an entire home.

[0047] After having selected an appropriate speaker volume level (low or high), the user can select the desired unit of temperature to be used and displayed on the LCD **128**, according to step **806**. Specifically, the measured temperature value may be displayed in units of degrees Centigrade (°C) or degrees Fahrenheit (°F) by moving the position of switch **142** to either position **140** or **138**, respectively.

[0048] Further use of the notification device **100**, with respect to warming of a nursing bottle and contents thereof, occurs according to step **808**, whereby a care giver removes the nipple and collar assembly **700,** shown in **FIG. 7**, from a bottle **604** containing a chilled or room-temperature baby beverage **608**, such as milk or formula. At step **810**, the user inserts the now open bottle upright into a warming means (not shown), preferably but not limited to an electric bottle warmer (water jacket or steam jacket type as previously described), a vessel of hot tap water or water being heated in a pan on a stove, or another known heating method. With the bottle now placed upright in the warming means, heat will begin to flow into the bottle and contents thereof, and the temperature of both will begin to rise.

[0049] Immediately after having completed step **810**, operation continues according to step **812**, whereby the user rests notification device **100** on top of the open bottle as shown in FIG. 7, such that support member **106** is centered in the bottle opening and the longitudinal axis of probe **104** is coincident with the longitudinal axis of the bottle **604**, in the case of a straight bottle. The static position of the temperature-sensitive probe tip **502,** relative to the contents of the bottle, may be adjusted by sliding the case **102** and probe **104** relative to the support member **106** as previously described. While, for illustrative purposes, probe tip **502** is shown near the bottom of the fluid column **608** residing in the bottle **604**, it will normally be more advantageous for the user to position the probe tip at the center of the fluid column, because while the temperature of the fluid may vary by as much as 15° Fahrenheit from top to bottom of the column throughout the warming process, the average

temperature will occur somewhere near the longitudinal center of the fluid column. Placement of probe tip **502** at the longitudinal and radial centers of the fluid column will help ensure the overall fluid temperature, when thoroughly mixed, will be acceptably close to the desired temperature.

[0050] With the notification device **100** now in temperature-sensing communication with the bottle's contents, and with the bottle simultaneously placed in the warming means, operation continues according to step **814**. In step **814**, the user is advantageously free to leave the vicinity where the bottle is being warmed, or simply not be as mindful of the process, since the previous need for a user to continuously and manually monitor the temperature of the bottle contents is now met automatically by notification device **100**. Specifically, in step **814**, whilst said temperature sensing and said heating process occur simultaneously, said operational circuitry (not shown) monitors the temperature of the bottle contents via a temperature signal received from said temperature sensor (not shown). As shown in steps **816**, **818, 820, 822, 824, 826** and **828**, said operational circuitry (not shown) compares the temperature signal received from the temperature sensor (not shown) to a predetermined temperature range, preferably defined as 70°-90° Fahrenheit, and also to individual temperature targets, preferably defined as 70° Fahrenheit and 90° Fahrenheit, although other temperature ranges and targets are possible. Specifically, in step **816**, whenever the temperature of the beverage or food being heated is less than 70° Fahrenheit, said operational circuitry causes LCD **128** in step **830** to display the word "COLD" **(FIG. 5)** to indicate the temperature of the beverage or food is unsuitably low for serving to a baby. Meanwhile, the speaker is silent. Furthermore, according to step **818**, whenever the temperature of the beverage or food being heated becomes equal to 70° Fahrenheit, said operational circuitry causes LCD **128** to instead display "70 COOL" **(FIG. 12)** in step **832** and simultaneously causes the speaker to emit a first audible tone for a discrete length of time at the selected volume level, all this to indicate the temperature of the beverage or food has reached a first point marginally suitable for serving to a baby. Also shown in **FIG. 12** is a low battery icon **144**, which illuminates on the LCD when the operational circuitry determines the battery life has nearly ended. Furthermore, according to step **820**, whenever the

temperature of the beverage or food being heated becomes equal to or is between 71° Fahrenheit and 89° Fahrenheit, said operational circuitry causes LCD **128** in step **834** to instead display the actual value of the temperature measured followed by the word "COOL" (for instance, "86 COOL" as shown in **FIG. 13**), to indicate the temperature of the beverage or food is within a range marginally suitable for serving to a baby. Meanwhile, the speaker is silent. Moreover, according to step **822**, whenever the temperature of the beverage or food being heated becomes equal to 90° Fahrenheit, said operational circuitry causes LCD **128** in step **836** to instead display "90 READY", as shown in **FIG. 14**, and simultaneously causes the speaker to emit a second audible tone for a discrete length of time at the selected volume level, whereby the nature of the second tone is clearly distinguishable from the first, all this to indicate the temperature of the beverage or food has reached a first point ideal for serving to a baby, as opposed to the first point marginally suitable for serving to a baby (70° Fahrenheit). Still further, according to step **824**, whenever the temperature of the beverage or food being heated becomes equal to or is between 91° Fahrenheit and 99° Fahrenheit, said operational circuitry causes the LCD **128** in step **838** to instead display the actual value of the temperature measured followed by the word "READY" (for instance, "96 READY" as shown in **FIG. 9**), to indicate the temperature of the beverage or food is within a range ideally suited for serving to a baby. Meanwhile, the speaker is silent. Moreover, according to step **826**, whenever the temperature of the beverage or food being heated is greater than 99° Fahrenheit, said operational circuitry causes the LCD **128** in step **840** to instead display the word "HOT" (see **FIG. 10**) and simultaneously causes the speaker to emit a third audible tone at the selected volume level, which emits continuously until the notification device is turned off or until the actual value of the temperature measured decreases to a value equal to or less than 99° Fahrenheit, all this to indicate the temperature of the beverage or food is too high for serving to a baby. Furthermore, according to step **844**, whenever the care giver is satisfied with any of the particular temperature conditions indicated in steps **832**, **834**, **836** or **838**, the care giver will proceed to complete the elements of step **846**, namely to remove the notification device **100** from the bottle **604**, then to attach nipple and collar assembly **700** to the bottle and then to

serve the bottle to a baby. Furthermore, according to step **828**, at any time during operation the user can deactivate the notification device **100**, including all visible and audible indicators, by moving the first switch **112** of the notification device **100** back to the "off" position **132**, thus ending the temperature monitoring process at step **842**.

[0051] An alternative embodiment of temperature probe is shown in **FIG. 11**, wherein the contact-type temperature responsive probe **104** is eliminated and substituted with a non-contact temperature sensing means, preferably an infrared temperature sensor **105**, whereby the receiving end **107** of the infrared sensor **105** is located above the surface of the column of beverage or food **608**. Whereas the surface of the contact-type temperature responsive probe **104** will need to be cleaned between each use in order to prevent food-borne bacteria buildup, no such cleaning will be required by employing a non-contact infrared temperature sensor **105**, which provides the obvious advantage of convenience. In addition, the non-contact infrared temperature sensor **105** may be able to ascertain an actual temperature several seconds more quickly than conventional contact-type temperature probes.

[0052] Although a first switch **112** is provided for activating and deactivating the notification device **100** as well as for selecting one of two speaker volume levels, and a second switch **142** is provided for selecting desired temperature units to display, it shall be appreciated that other switching and selection techniques may also be provided. For example, a single multifunction switch can be provided to achieve the above functions in concert with icon or menu driven options displayed on the LCD. Similarly, an apparatus can be provided whereby one or more signaled target temperatures within the aforementioned predetermined temperature range can be manually selected by the care giver via an analog or microprocessor-based switching algorithm or protocol, in order to provide the care giver flexibility to target distinct temperatures preferred by a baby. In addition, it may be desirable to incorporate only one level of speaker volume, thereby eliminating a need for a volume selection switch. Furthermore, it shall be appreciated that other combinations of visible and audible signals may be provided, such as providing a visible and audible signal simultaneously to indicate the temperature of a baby beverage or food is too low for serving to a baby, or providing only a visible signal to indicate the temperature of a baby beverage

or food is too high for serving to a baby safely. The temperature probe **104** may also be configured to be detachable from the case **102** rather than being permanently affixed to case **102**. A detachable probe may be advantageous for purposes of sterilizing the probe without having to subject the case **102** to the same conditions. In addition, the temperature probe **104** and support member **106** may be provided separately from a case **102**, whereby the probe **104** transmits a temperature signal wirelessly to a receiver housed in the case **102** using radio frequencies or other known wireless transmission mediums.

[0053] Although notification device **100** is preferably adapted to a nursing bottle through an opened end of said nursing bottle, where said opened end is exposed by virtue of having removed the nipple and collar assembly **700** from said nursing bottle **604**, other means for adapting notification device **100** to a nursing bottle may be provided. For example, probe **104** of notification device **100** can enter the interior of a nursing bottle through an opening in the nipple or through axially aligned openings in the nipple and collar. Furthermore, the probe can enter the bottle through an opening in a wall of the nursing bottle, where said opening can be provided with a seal for preventing liquid leakage. In addition, notification device **100** can be made as a permanent or removable part of a nursing bottle assembly or any of a nursing bottle's components without deviating from the true spirit and scope of the invention. Furthermore, notification device **100**, or similar forms thereof, can be made as a permanent or removable part of a bottle warming means.

[0054] Referring to **FIG's 15-19**, another embodiment of a beverage and temperature notification device **150** is shown to include a case **152** joined to a temperature responsive probe **154**, and a support member **156** engaged with said probe. Case **152** houses operational circuitry **504** and a battery, and includes control and message areas, which are discussed in greater detail hereinafter. Probe **154** may be constructed, at least partially, of a suitably heat conductive material, such as stainless steel. Disk-like support member **156** has a centrally located hole **158** that engages and frictionally slides about probe **154**. Although said support member is preferably circular in plan view, other shapes are possible, such as square, rectangular, triangular and so forth. The static position of support member **156** relative to case

**152** and probe **154** may be adjusted by sliding the support member about the longitudinal axis of probe **154**, wherein one possible position is shown in **FIG's 15** and **16**. In addition, as shown in **FIG. 18**, support member **156** can be removed from probe **154** by sliding action, where said removal will be generally desirable for minimizing the space required for storage of the notification device **150** when not in operation.

[0055] Probe **154** includes a temperature sensor **500**, preferably a thermistor, although other devices, for example, thermocouples or resistance temperature detectors, could be used, where said temperature sensor is typically located at or a near tip **502** of probe **154** for providing an electrical signal that is proportional to a sensed temperature. Operational circuitry **504,** is housed in case **152** and receives said electrical temperature signal from temperature sensor **500** in a generally known manner. Operational circuitry **504** may comprise analog or digital devices and may be microprocessor based. A replaceable battery (not shown) powers operational circuitry **504**. Case **152** may be water resistant or water proof for ensuring reliable operation of operational circuitry **504**.

[0056] Referring to **FIG. 20**, notification device **150** is illustrated in use with a conventional nursing bottle **604**, wherein the nursing bottle and contents thereof are subjected simultaneously to a conventional heating method (not shown), such as partial immersion in water. Specifically, the nipple and collar assembly **700** is shown removed from bottle **604** to provide an opened end of said nursing bottle. Support member **156** rests upon the opened end of the nursing bottle, firstly enabling monitoring notification device **150** to be viewed reliably by a user, such as a baby's care giver, and secondly enabling notification device **150** to be maintained in operable communication with nursing bottle **604** and contents thereof. Furthermore, the user can slide case **152** and probe **154** relative to support member **156** in order to position tip **502** of probe **154** at a desired and suitable location within the nursing bottle, specifically into intimate contact with the nursing bottle contents, which may be any beverage or food (not shown), such as milk, juice, water or cereal, for the purpose of sensing the temperature of said contents. The aforementioned ability to adjust the position of tip **502** is particularly advantageous given the various shapes and sizes of

commercially available baby beverage and food containers, and given the varying amounts of beverage or food that may reside in the container. While support member **156** preferably rests by gravity upon the opened end of a beverage or food container, it should be appreciated that other features for adapting the support member in a more secure way to the container can be provided, such as by thread or other clamping feature.

[0057] Referring again to **FIG. 15**, case **152** includes a control area **160,** shown in broken line representation, which is interactive with operational circuitry **504**. Control area **160** includes a multifunction push button switch **162** by which the user can activate and deactivate the notification device **150** as well as select a volume level for audible indicator **163**, which is housed in case **152**. In addition, case **152** includes a notification area **164**, shown in broken line representation, which is interactive with operational circuitry **504**, for indicating various conditions, such as whether or not notification device **150** is activated, the selected level of speaker volume, and whether or not the temperature of a beverage or food being sensed is within a predetermined range suitable for serving to a baby. Specifically, notification area **164** comprises various visible indicators (to be discussed in greater detail hereinafter) preferably of the light emitting diode (LED) type, which are used in various combinations with audible indicator **163**, preferably a speaker or speakers of the piezo type, to notify a user, such as a baby's care giver, of the aforementioned conditions. The aforementioned visible indicators are used in combination with worded and graphics areas **165** and **167** on case **152** for indicating the aforementioned conditions. In addition, case **152** provides a surface **169** on which a trademark for the device can be displayed.

[0058] The operation and use of notification device **150**, specifically in conjunction with the heating of a baby beverage or food container, such as nursing bottle **604**, will be better appreciated with specific reference to **FIG's 15** and **20** and the logic flow chart shown in **FIG. 21**. Control of notification device **150** starts at step **850**. When device **150** is in an inoperative state, all visible and audible indicia are deactivated, as shown in step **852**. In operation, the user can activate notification device **150** by depressing switch **162**. Specifically, the user must depress switch **162**

repeatedly, as shown in step **854**, in order to activate notification device **150** and select a desired speaker volume from one of at least two sound pressure levels, such as "low" or "high", whereby a "low" sound pressure volume is suitably audible over short distances, such as across a bedroom, and a "high" sound pressure volume is suitably audible over a larger distance, such as across an entire home. Operational circuitry **504** monitors the amount of time that elapses between each distinct depression of switch **162**. After sensing and counting the initial depression, a subsequent depression is counted by the operational circuitry only if it occurs within three seconds of the prior depression, which is a preferred maximum period of time, although other time periods are possible. If and when more than three seconds elapses after any counted switch depression, the logical decision in step **856** is completed. Specifically, as shown in step **856**, the number of distinct switch depressions sensed and counted by the operational circuitry determines the operational state of the notification device **150** and the selected volume level. If only one distinct switch depression is counted, the "On" LED **166** and "Low" speaker volume LED **168** are lit by the operational circuitry, as shown in step **858**. Alternatively, if two distinct switch depressions are counted, only the "On" LED **166** and "High" speaker volume LED **170** are lit by the operational circuitry, as shown in step **860**. Alternatively, if three distinct switch depressions are counted, notification device **150** and all indicia are returned to the aforementioned inoperative state, as shown in step **862**.

[0059] In operation, probe **154** is inserted through an open end of a beverage or food container, which may be the nursing bottle **604**, a food jar or the like, such that probe **154** is maintained in intimate contact with the baby beverage or food, whereby said intimate contact is intended to occur throughout a heating process of the food container and contents thereof, such as by a commercial baby bottle warmer. Whilst said intimate contact and heating process occur simultaneously, operational circuitry **504** simultaneously monitors and compares the temperature signal received from temperature sensor **500** to a predetermined temperature range, as shown in steps **864** and **866** respectively, where said predetermined temperature range is defined preferably as 90° Fahrenheit to 100° Fahrenheit, although other such temperature ranges are possible. As shown in step **868**, whenever the temperature of the beverage

or food being heated is within the range of 90° Fahrenheit to 100° Fahrenheit, said operational circuitry illuminates "Ready to Feed" LED **172** to indicate the temperature of the beverage or food is suitable for serving to a baby, and operational circuitry **504** simultaneously activates speaker **163** at said selected speaker volume to provide audible and remote notification of the same. The audible signal is preferably cyclic in nature, providing a series of five distinct beep tones followed by 15 seconds of silence, with the duration of each beep tone being one half second and with each beep tone spaced one half second apart, although other audio signals are possible, such as continuous chimes, songs or the like. The "Ready to Feed" LED **172** remains lit and the audio signal repeats as long as the temperature signal is between 90° Fahrenheit and 100° Fahrenheit. However, whenever the temperature of the beverage or food being heated exceeds 100° Fahrenheit, said operational circuitry first deactivates the "Ready to Feed" LED **172** and the audio signal, then lights a "Too Warm" LED **174** to indicate the temperature of the beverage or food is not suitable for serving to a baby, as shown in step **870**. As shown in step **872**, whenever the temperature of the beverage or food is below 90° Fahrenheit, all visible or audible signals are deactivated other than "On" LED **166** and whichever LED is active for signaling volume level, namely "Low" LED **168** or "High" LED **170**. Furthermore, as shown in step **874**, the notification device **150** and all aforementioned visible and audible indicators are deactivated if and when the user depresses switch **162** at any time subsequent to notification device **150** having started to monitor temperature in step **864**, and control of notification device **150** subsequently ends at step **876**.

[0060] Referring to **FIG's 22** and **23**, notification device **150** is shown with an alternately configured case **103**. Case **103** is shown as one of a variety of alternative shapes, in this instance a cylindrical shape. It should also be appreciated the aforementioned control area and notification area may be provided on a top **105**, side **107** or bottom face **109**.

[0061] Referring to **FIG. 24**, the contact-type temperature responsive probe **154** may be replaced with a non-contact temperature sensing means, preferably an infrared temperature sensor **111**. While the contact-type temperature responsive probe **154** may need to be cleaned of beverage or food subsequent to use, no such

cleaning will be required by employing a non-contact infrared temperature sensor, which can be advantageous. In addition, the non-contact infrared temperature sensor can sense temperature accurately more quickly than typical contact-type temperature probes, which may also be advantageous.

[0062] Although multifunction push switch **162** is preferred for activating and deactivating the notification device **150**, as well as for selecting one of at least two speaker volume levels, it should be appreciated that other switching techniques may also be provided. For example, a single switch can be provided for activating or deactivating the notification device **150** and a separate switch can be provided for selecting one of at least two volume levels. In addition, it may also be desirable to provide only one level of speaker volume, thereby eliminating a need for a volume selection switch. Furthermore, it shall be appreciated that other combinations of visible and audible signals may also be provided, such as providing a visible and audible signal simultaneously to indicate the temperature of a baby beverage or food is too high for serving safely to a baby, or providing a visible signal to indicate the temperature of a baby beverage or food is too low for serving to a baby.

[0063] Although notification device **150** is preferably adapted to a nursing bottle through an opened end of said nursing bottle, where said opened end is exposed by virtue of having removed a nipple and collar assembly from said nursing bottle, other means for adapting notification device **150** to a nursing bottle can be provided without having to remove the nipple and collar from the bottle prior to use of the device. For example, probe **154** of notification device **150** can enter the interior of a nursing bottle through a hole in the nipple or through axially aligned holes in the nipple and collar. Furthermore, probe **154** can enter the bottle through a hole in a wall of the nursing bottle, where said hole can be provided with a seal for preventing liquid leakage. In addition, notification device **150** can be made as a permanent or removable part of a nursing bottle assembly or any of a nursing bottle's components, without deviating from the true spirit and scope of the invention. Furthermore, notification device **150**, or similar forms thereof, can be made as a permanent or removable part of a bottle warming means.